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FACT SHEET

L-894

Keys To Profitable Rice Production*

The Texas rice industry, which has grown from 110 acres in 1850 to a high of 642,000 in 1954, has been marked by significant yield increases and improved varieties. The largest production was in 1968 when a record 25,408,282 hundred weights were harvested. Highest per-acre yields of 5,004 pounds per acre occurred in 1967.

For the past 20 years, long-grain varieties have predominated in Texas. However, this varies within areas of the rice belt, for medium grains have gained in prominence in some years.

The most significant increases in Texas rice yields have been during the past 10 years. These increases were primarily caused by the development and use of very early-maturing varieties with high yield potential, chemical grass control, increased utilization of fertilizer and stubble-cropping practices.

CLIMATIC RESTRICTIONS

The approximate 180-day rice-growing season begins about March 15 in the western area and about April 1 in the eastern area of the Coast Prairie. The growing season ends about October 15 when cold fronts normally cover the rice belt, lowering temperatures below 50 degrees F. for several days.

Yields generally are higher in dry sunny seasons than in rainy, cloudy seasons because of differences in available sunlight. Planting dates also influence the amount of light the crop receives during critical stages of plant growth. Because of better utilization of existing climatic conditions, very early maturing varieties normally produce maximum first-crop yields from late March to mid-April plantings.

LAND USE SEQUENCE

With effective control of grasses, weeds and adequate fertilization, high yields are possible under short rotation systems. Satisfactory yields have been produced by seeding the same land to rice in consecutive years. With improved drainage and water management caused by land leveling and cheaper costs of herbicides, this practice may increase. Proper seedbed preparation for early spring planting the next year may be a problem in intensified cropping sequences. One year rice with stubble cropping and one year fallow with summer and fall land preparation is becoming an increasingly popular sequence.

Stubble cropping does not lend itself to continuous cropping for several reasons. Sometimes it is difficult to prepare the soil for planting the next spring as fields dry very slowly. Weed control must be effective, since stubble cropping can result in a large buildup of weed seed caused by longer growing conditions for weeds. Stubble cropping does not change normal rice to red rice, but increases chances of existing red rice to reseed, thus increasing contamination. Harvesting equipment, cattle, birds and contaminated seed rice can spread the infestation from one field to another.

Stubble cropping offers the opportunity of increasing production efficiency and relieving the cost-price squeeze dilema caused by high production costs and low prices. For detailed information, obtain a copy of L-773, *Second Crop Rice Production,* from your local county agent.

LAND PREPARATION

Timely land preparation is essential to successful rice production. Soil preparation should be such to permit early spring seedings even under wet conditions. This means plowing the soil in summer or early fall. Fields need to be near level to insure uniform irrigation, good weed control and proper drainage. Many producers consider land planing a normal step in land preparation. Water leveling is becoming increasingly popular in Texas. Adequate drainage is important to permit machinery in the fields soon after rain during land preparation stages and to provide uniform germination of rice seed after planting. Field drains should be prepared to assure complete and rapid drainage of the field. These drains should be reopened after each field operation as required.

Soil moisture and texture determine the proper time to plow. Early land preparation allows several crops of grass and red rice to be killed by surface cultivation before planting. Deep plowing in old rice fields which may expose buried red rice seed, is being practiced less.

The vertical interval between levees should maintain water depths no more than 6 inches and no less than 3 inches. Shallow water depths of 3 to 4 inches favor higher yields if grass and weeds are controlled.

SEEDBED PREPARATION

In sandy soils, prepare a well-pulverized seedbed under proper moisture conditions for drill seeding.

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Flush heavy clay soils immediately after seeding for uniform emergence.

If rice is to be water-seeded, the seedbed should be left in a rough, cloddy condition so the clods will melt and give some coverage to the seed. Broadcasting dry seed on a well-prepared seedbed, followed by "dragging" to cover the seed, is popular in some areas.

SEEDING DATES

The optimum seeding date varies with location. In the western area it is March 25 to April 15, while in the eastern area it is April 1 to April 15. Earlier planting dates are hazardous because of reduced and irregular stands. Progressively later planting dates normally reduce yields. Yields from May plantings are variable from year to year and June plantings are not recommended.

Seedlings emerging from mid-March seedings normally are about 15 to 20 percent lower than mid-April seedings because of cool temperatures and saturated soils. Mid-May and later plantings may reduce the number of seedlings emerging by 10 to 15 percent because of high soil temperatures.

SEEDING METHODS

Seeding methods depend on soil type, weather conditions and producer preference. The main factors to consider in seeding methods are uniformity of seed distribution and seedling emergence. These promote good yields as well as uniform quality rice.

There is no evidence of a yield advantage of drilled over broadcast seeding or dry over water seeding if stands are adequate. Rice stands of 15 to 30 seedlings per square foot should be capable of average or above average yields. A 90-pound seeding rate of high germination seed (85 percent or more) per acre in mid-April should result in a stand near the 30 plants cited earlier. Upward adjustments in seeding rates may be necessary for very early or very late planting dates to achieve 30 seedlings per square foot.

On sandy soils, place seed in moist soil 1 to 1½ inches deep. Seeding depth will vary with moisture conditions. On heavy soils or soils where flushing is necessary, seeding should be no deeper than ½ inch.

VARIETIES

Rice variety selection is influenced by the area of production, level of production, disease problems, potential of a second crop and market values. Recommended varieties are Bluebelle, Belle Patna, Dawn, Nato, Saturn and Starbonnet. For more detailed information, see L-827, *Rice Varieties for Texas,* available from your local county agent.

FERTILIZATION

RECOMMENDED RATES. Most Texas soils respond to 40 pounds of phosphorus per acre. Light soils usually respond best to 60 pounds of nitrogen per acre, while heavy soils require about 80 pounds. Yield increases on Katy fine sandy loam often result from 20 pounds of potash per acre. On this basis, the following minimum fertilizer recommendations are suggested.

Beaumont clay	80-40-0*
Lake Charles clay	80-40-0*
Bernard clay loam	80-40-0*
Katy fine sandy loam	60-40-20*
Hockley fine sandy loam	60-40-0*
Edna fine sandy loam	60-40-0*

*Increase N level by 25 percent for Bluebelle.

Rate is more important than timing of nitrogen. However, as nitrogen rates are increased, timing of application becomes more important. Whenever rice shows nitrogen deficiencies, apply nitrogen as soon as possible, regardless of growth stage.

For detailed fertilizer information, see L-783, *Rice Fertilizer Recommendations,* available from the local county agent.

MICRONUTRIENTS. Limited research shows that zinc and iron micronutrient fertilization is economical when applied to rice grown on "cut areas" and on soils that historically have produced chlorotic seedlings. Generally, these soils are alkaline, high in calcium, bicarbonate and have normal sodium levels. In these situations, the application of 10 pounds of zinc sulfate plus 100 pounds of iron sulfate per acre at seeding is suggested. The rate of other sources will depend on zinc and iron content and availability. Micronutrient fertilization has not increased yields except in areas where chlorotic or yellow seedlings existed.

WATER MANAGEMENT

Fields should be level enough to maintain 3 to 6-inch water depths for weed control. During the seedling growth period, soil moisture should be adequate but fields should not be flooded. Excessive flooding can reduce seedling survival and tillering. When possible, delay first flood until tillering has begun or about 3 weeks after seedling emergence. Grass or weed infestations may require earlier flooding.

Flooding is primarily for control of grass and weeds until the beginning of the reproduction stage. At this time, a shallow flood should be applied and maintained to insure an adequate moisture supply until final drainage before harvesting. Do not remove water too early before harvesting on early planted fields. Fields normally dry more quickly in July and August than later in the season.

WEED CONTROL

Good cultural practices in combination with herbicides are essential for economical weed and grass control. Labeled chemicals used at proper rates, volumes of carrier and timing of application are essential for good results without danger of harmful herbicide residues in the rice grain and straw. Avoid use of adjuvants not registered for use with rice herbicides and follow closely label recommendations of registered herbicides.

Present USDA registered rice herbicides do not control all grasses and broad-leaved weed species in rice fields. Resistant weeds will increase if chemical and cultural control is inadequate. For example, sprangletop, *Leptochloa* spp., is resistant to presently recommended

herbicides, and infestations are increasing in Texas rice fields.

The hormone-type herbicides 2,4-D, 2,4,5-T and silvex amine salts, applied by air or with ground equipment will control annual broadleaves and some sedges. These herbicides are regulated by the State Herbicide Law in certain counties.

Spray hormone-type herbicides on rice *only* when rice is in the late tillering to very early jointing or panicle development stages. The initial panicle development stage occurs much sooner after the late tillering stage in very early maturing varieties than in later maturing varieties. Therefore, the safe period for hormone-type herbicide application is extremely short in very early maturing varieties. A careful examination of plants is the best way to determine the most tolerant growth stage. To apply hormone-type herbicides within 2 weeks after application of nitrogen fertilizer is hazardous, since plant growth is stimulated by the nitrogen. Nitrogen applications 4 to 5 days after hormone herbicide application should not harm the rice.

Propanil is used extensively in rice for barnyardgrass control. It works best when the grasses are actively growing in the two to three-leaf stage. Since propanil is a contact herbicide, it does not prevent additional grass seed from germinating. This means fields should be flooded 3 to 4 days following propanil treatment to control newly sprouting grasses. Propanil also controls several seedling broad-leaved weeds.

In some instances, grass emerges with or before the rice, and requires a propanil treatment before the rice seedling can withstand a prolonged flood. Farmer experience indicates that propanil can be applied to a field of emerging rice without serious damage as soon as the young rice shoots turn green. A second treatment may be applied on later emerging grasses, at which time the rice can be flooded 3 to 4 days after treatment. *The total rates of multiple propanil application should not exceed the label rates.*

Apply molinate aerially in granular form for control of barnyardgrass in the seedling stage of development. For best control, apply molinate into the flood when barnyardgrass is 1 to 5 inches tall. Maintain the flood at a depth of two-thirds the grass height at least 7 to 10 days, or until good weed control is accomplished.

Aerially applied liquid herbicides are susceptible to spray drift. Adjacent crops, vegetable gardens and home landscape plants may be injured. In certain counties, the State Herbicide Law sets limitations on wind velocity when spraying 2,4-D, 2,4,5-T and silvex.

Similar guidelines can be adopted when spraying propanil.

No herbicides presently are recommended or labeled for stubble crop rice.

Suggestions for chemical rates and time of application of herbicides in rice are listed in B-1029, *Suggestions for Weed Control With Chemicals,* available from the local county agent.

RICE DISEASES

SEEDLING BLIGHT. Use of fungicides as a means of controlling seedling blight is economical and provides stand insurance. Treat all rice seed before seeding. The following fungicides are recommended for seedling disease control:

Arasan - 75	1 oz/bu.
Arasan - 42-S	1 ½ oz/bu.
Arasan SF-X & SF-M	1 oz/bu.
Ceresan M	½ oz/bu.
Chipcote 75	½ oz/bu.
Panogen 15	½ oz/bu.

Caution: Study label for restrictions on use.

STRAIGHTHEAD. When growing susceptible varieties on land subject to straighthead disease, drain the water from the field and allow the soil to dry for 7 to 10 days just before jointing stages of growth. Do not reflood the field until the soil is dry enough to crack and the rice plants show a slight yellowing. Resistant varieties are the best means of control.

BLAST. Conditions conducive to excessive leaf moisture favor the incidence of blast disease. Blast injury during early growth may be reduced by submerging the land as soon as the leaf spots become evident. Maintain full floods until plants recover. Withhold additional nitrogen when the disease is present. Resistant varieties are the best means of control. No chemical control of this fungus disease is recommended.

KERNEL SMUT. There are no practical controls for kernel smut at present.

RICE FIELD INSECTS

RICE WATER WEEVIL. The adult rice water weevil feeds on the leaves and the larva feeds on the roots. Yield is lowered only by larval damage to the roots. Yield has been reduced when the larval population is 25 or more per foot of drill row.

RICE STINK BUG. The rice stink bug, shield-shaped and straw-colored, feeds on rice during the heading stage. Both adult and nymphal stages feed on the developing grains, causing lower total yields, milling yields and grades of rice.

FALL ARMYWORM. Fall armyworms can severely damage seedling rice. Young stands may be destroyed if the larvae are not controlled by flooding or by spraying with insecticides.

GRASSHOPPERS. Several species of grasshoppers invade rice fields. The most common and most abundant is a green grasshopper that causes little or no injury to rice. A large brown and yellow grasshopper may migrate into rice fields from pasturelands as food becomes scarce. This species chews on the stems of the rice plant producing white, unfilled heads.

See your county Extension agent for current recommendations for control of major pests. Note precautions and directions for insecticide use for most effective control and to avoid plant injury.

HARVESTING

Remove irrigation water from the field when rice heads are well turned down and in sufficient time for the soil to become firm for combine operations, especially if a stubble crop is anticipated.

Harvest rice when the average grain moisture is 18 to 22 percent.

Large grain losses often occur because functions of the combine are not fully understood. Follow directions in the manufacturer's instruction manual to make adjustments for efficient operation. Losses can occur at the combine platform from shattering, from partially threshed heads or from threshed grains coming out with the straw. Each problem requires independent adjustment. Grain in straw or on the ground behind the combine can be used to estimate losses. Approximately 725 kernels in a strip 1′ X 10′ is equal to 1 barrel per acre loss.

ON-FARM DRYING AND STORAGE OF ROUGH RICE

Mold growth threat is greatly reduced if the moisture content is lowered to 15 percent or less within a short time. The remainder of the drying can be accomplished over a longer period. The allowable time to reduce moisture content to 15 percent depends on initial rice moisture content and temperature of the outside air. The cooler the temperature, the longer the allowable time to reduce moisture content to 15 percent. In August, rice with an initial moisture content of 20 percent should be dried to 15 percent moisture content in 5 to 7 days to prevent damage from molds. In late September, this drying should be accomplished within 10 to 14 days.

A maximum moisture content of 13 percent is recommended for winter storage in drying bins, although rice mills specify a moisture content of 12.5 percent or lower when they bid on rice. The moisture content of 15 and 13 percent are maximum in all parts of the storage bin and not average moisture content.

RICE MARKETING

The marketing of rice is characterized by the high cost of handling, heavy dependency on foreign markets, high total cost of transportation and the need for stronger unified sales organization. Guidelines for marketing future crops of Texas rice through the producer's marketing organization should include:

1. Develop a system for commingling rough rice in the drying and storage phases of marketing operations.

2. Seek cost reductions by utilizing rice drying and storage facilities for available other crops.

3. Take advantage of large-volume, bulk rail shipments in covered hopper cars.

4. Develop a coordinated transportation system involving leased equipment to shuttle rice between dryers, storage points and mills.

5. Develop fewer but larger producer marketing organizations to achieve more bargaining strength in both the economic and political spheres, a unification of export marketing activities and higher efficiency in rice handling and movement operations.

6. Develop and adopt a quality identification system that encourages efficiency in the mass handling and trading of rice. Emphasis should be on variety, uniformity and quality rather than diverse individual ownership identity. Market building — the creation of new markets or expansion of existing markets — to be successful will require the coordinated effort of all segments of the industry.

ECONOMICS OF PRODUCTION

Rice production practices vary in importance from one soil resource area to another. Adequate records and accounts are necessary to determine the profitability of rice production, or of any practice used. Partial budgets should be used to show the added costs versus added returns of the practices.

Estimated Yield, Price, Income, Production Costs, Harvesting Costs, and Income Over Specified Costs for Rice Production

	First Crop	Stubble Crop
Yield—bbl. per A, 12.5% moisture	26	6
Price—$ per barrel, 12.5% moisture	7.53	7.53
Income—per acre	$195.78	$45.18
Production costs per acre:		
Seed—100 lb. @ .10/lb.	$ 10.00	
Fertilizer, 100-40-20	16.00	
Fertilizer, 60-0-0		$ 6.60
Application cost	3.00	1.00
Herbicide:		
Grass control	11.00	
Broad leaf control	1.50	
Insecticide	2.20	
Tractor & equipment— 4.31 hr. @ $1.50/hr.	6.47	
Tractor & equipment— 1.12 hr. @ $1.50/hr.		1.68
Irrigation	14.00	3.00
Labor—9.28 hr. @ $1.30/hr.	12.06	
Labor		3.00
Interest on operating capital	3.05	
Total specified production costs:	$ 79.28	$15.28
Harvesting costs per acre:		
Combining (custom)	$ 11.82	$ 6.18
Hauling	4.38	1.02
Drying—28.4 bbl., 20% moisture	14.14	
Drying—6.6 bbl., 20% moisture		3.26
Labor	2.08	1.30
Total specified harvesting costs:	$ 32.42	$11.76
Total specified costs:[1]	$111.70	$27.04
Income over specified costs:	$ 84.08	$18.14

[1]Costs do not include unallocated overhead costs such as interest on farm real estate and machinery, depreciation on farm buildings and machinery, pickup expense, insurance and taxes.

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